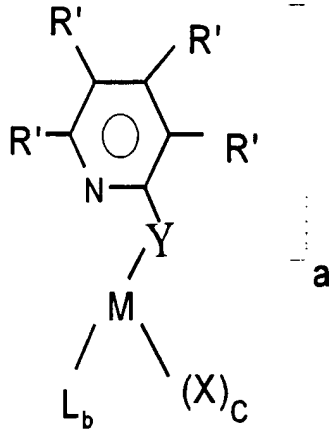
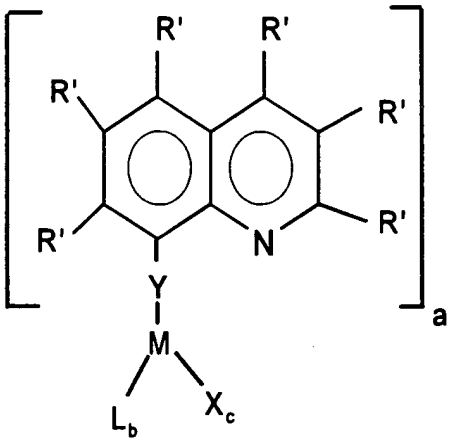
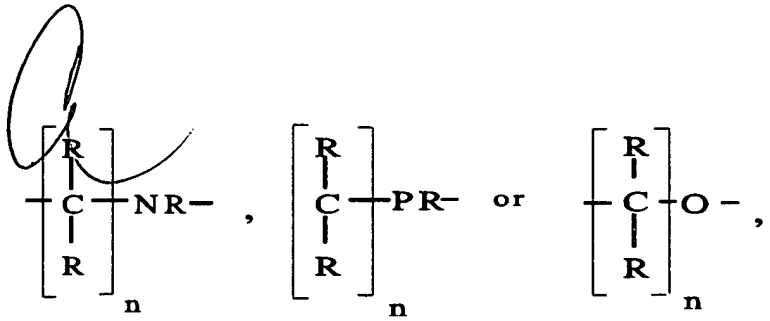
WE CLAIM:

1. A catalyst having the general formula

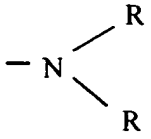


or

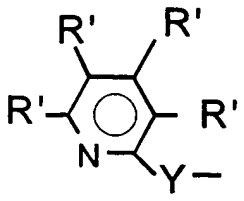


where Y is O, S, NR, PR, 

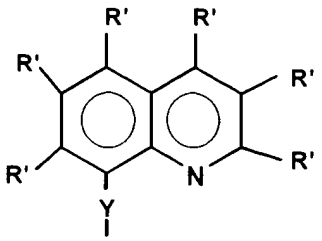
each R is independently selected from hydrogen or C_1 to C_6 alkyl or C_6 to C_{14} aryl, each R′ is independently selected from R, C_1 to C_6 alkoxy, C_7 to C_{20} alkaryl, C_7 to C_{20} aralkyl, halogen, or CF_3, M is a Group 3 to 10 metal, each X is independently selected from halogen, C_1 to C_6 alkyl, C_6 to C_{14} aryl, C_7 to C_{20} alkaryl, C_7 to C_{20} aralkyl, C_1 to C_6 alkoxy, or



L is X, cyclopentadienyl, C_1 to C_6 alkyl substituted cyclopentadienyl, indenyl, fluorenyl, or



or



"n" is 1 to 4;

"a" is 1 to 3;

"b" is 0 to 2;

$a + b \leq 3$;

"c" is 1 to 6; and

a + b + c equals the oxidation state of M.

2. A catalyst according to Claim 1, wherein $a + b \leq 2$ when the oxidation state of M is 4 or less and $a + b \leq 3$ when the oxidation state of M is greater than 4.

3. A catalyst according to Claim 2, wherein $a + b \leq 2$ when the oxidation state of M is greater than 4.

4. A catalyst according to Claim 1, wherein Y is oxygen.

5. A catalyst according to Claim 1, wherein X is halogen.

3 6. A catalyst according to Claim 5, wherein X is chlorine.

1 7. A catalyst according to Claim 1, wherein M is a Group 3 to 7 metal.

1 8. A catalyst according to Claim 7, wherein M is a Group 4, 5 or 6 metal.

1 9. A catalyst according to Claim 8, wherein Y is oxygen.

1 10. A catalyst according to Claim 8, wherein M is titanium, zirconium or hafnium.

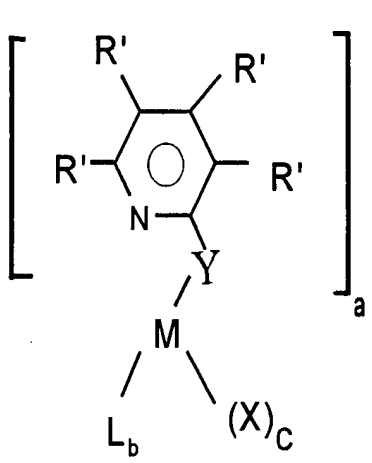
1 11. A catalyst according to Claim 10, wherein M is titanium or zirconium.

1 12. A catalyst according to Claim 11, wherein Y is oxygen.

1 13. A catalyst according to Claim 11, wherein X is halogen.

1 14. A catalyst according to Claim 12, wherein X is chlorine.

15. A method of making a poly-α-olefin comprising polymerizing an α-olefin monomer using a catalyst that has the general formula



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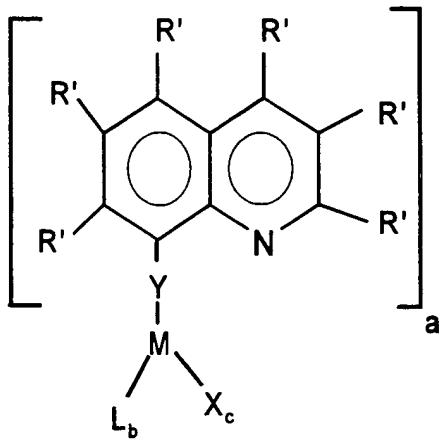
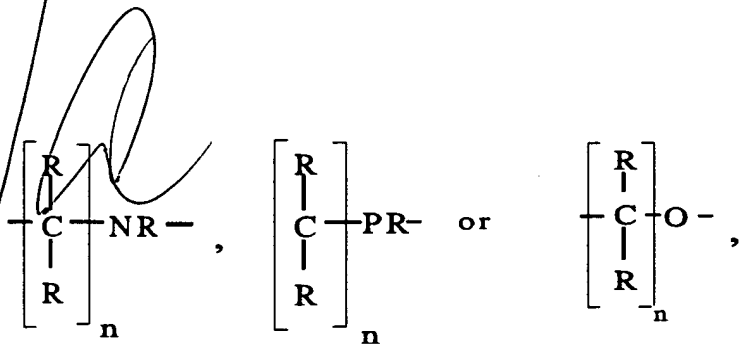
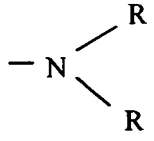


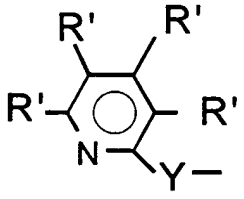
where Y is O, S, NR,

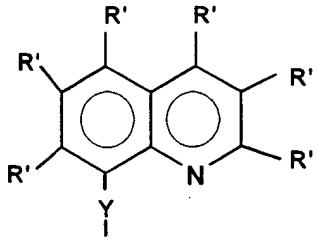


each R is independently selected from hydrogen, C_1 to C_6 alkyl, C_6 to C_{14} aryl, each R′ is independently selected from R, C_1 to C_6 alkoxy, C_7 to C_{20} alkaryl, C_7 to C_{20} aralkyl, halogen, or CF_3, M is a Group 3 to 10 metal, each X is independently selected from halogen, C_1 to C_6 alkyl, C_6 to C_{14} aryl, C_7 to C_{20} alkaryl, C_7 to C_{20} aralkyl, C_1 to C_6 alkoxy, or



L is X, cyclopentadienyl, C_1 to C_8 alkyl substituted cyclopentadienyl, indenyl, fluorenyl, or





"n" is 1 to 4;

"a" is 1 to 3;

"b" is 0 to 2;

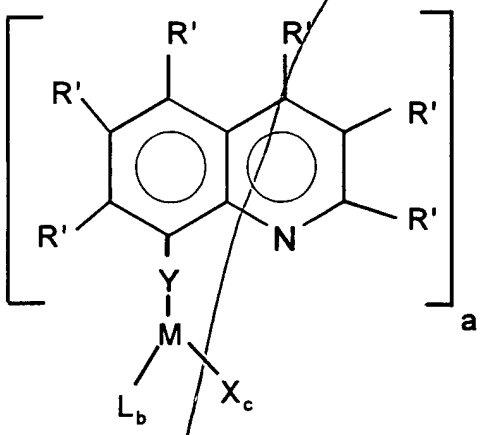
$a + b \leq 3$;

"c" is 1 to 6; and

a + b + c equals the oxidation state of M.

16. A method according to Claim 15, wherein said catalyst has the general formula

17. A catalyst according to Claim 16, wherein a + b ≤ 2 when the oxidation state of M is 4 or less and a + b ≤ 3 when the oxidation state of M is greater than 4.



18. A catalyst according to Claim 17, wherein a + b ≤2 when the oxidation state of M is greater than 4.

19. A method according to Claim 17, wherein Y is oxygen.

20. A method according to Claim 16, wherein M is a Group 4 to 6 metal.